

KEK beam test

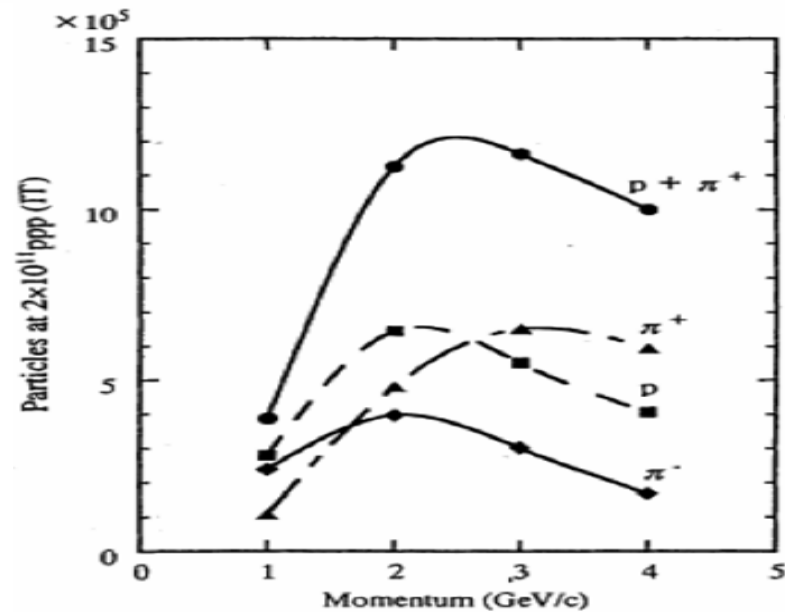
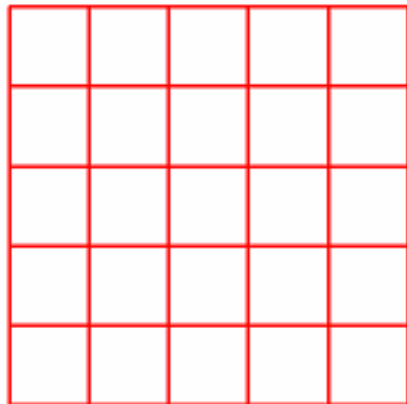
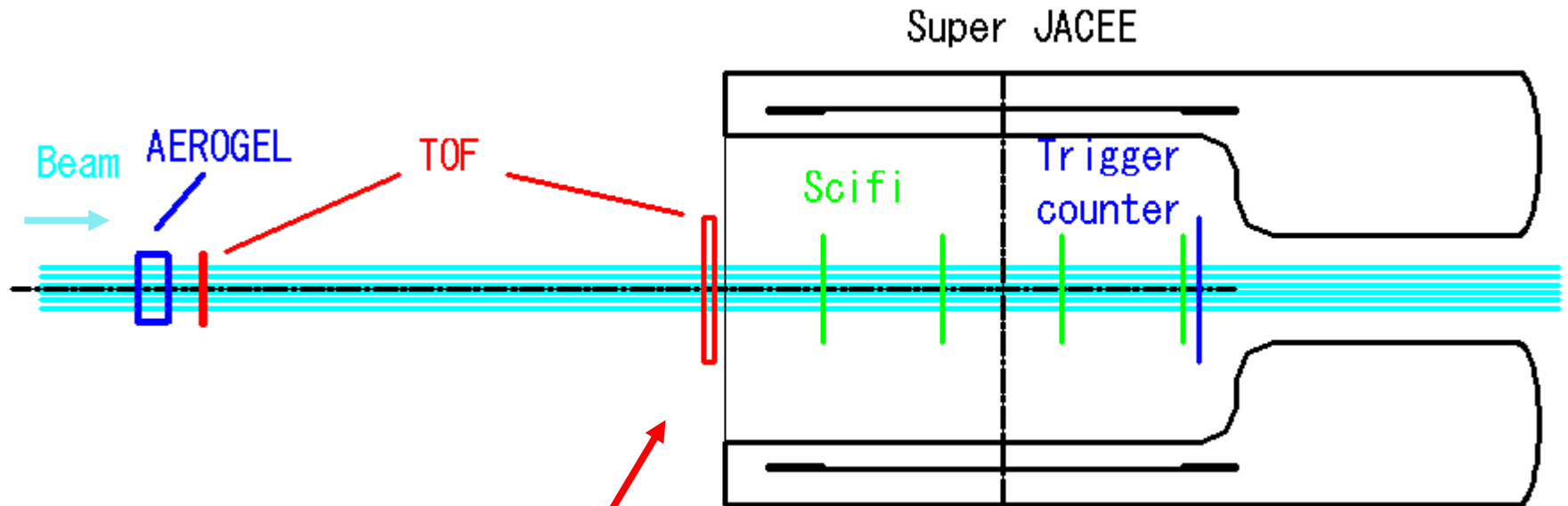
- Test for the SciFi tracker with 1T solenoid magnetic field
- $p/\pi/\mu/e$ test beam line in KEK-PS
- Slow extraction from the internal target in 2-sec flat top of a 4-sec spill
- Add 4th station to the prototype tracker
- Newly developed Cryostat with Cryocooler
 - 2 VLPC cassettes
 - 2048 Channels

1st Phase

- **Basic performance check**
 - Confirmation of cosmic-ray run with new VLPC cryostat
 - light yield
 - comparison of fiber concentration
 - VLPC vs PMT
 - Minimum ionizing - Defocus beam
 - position resolution (Alignment error)
 - Minimum ionizing - Defocus beam
 - Inclined beam (detector be tilted)
 - multiple scattering - material thickness
 - momentum/angle dependence
 - various momentum

High intensity beam

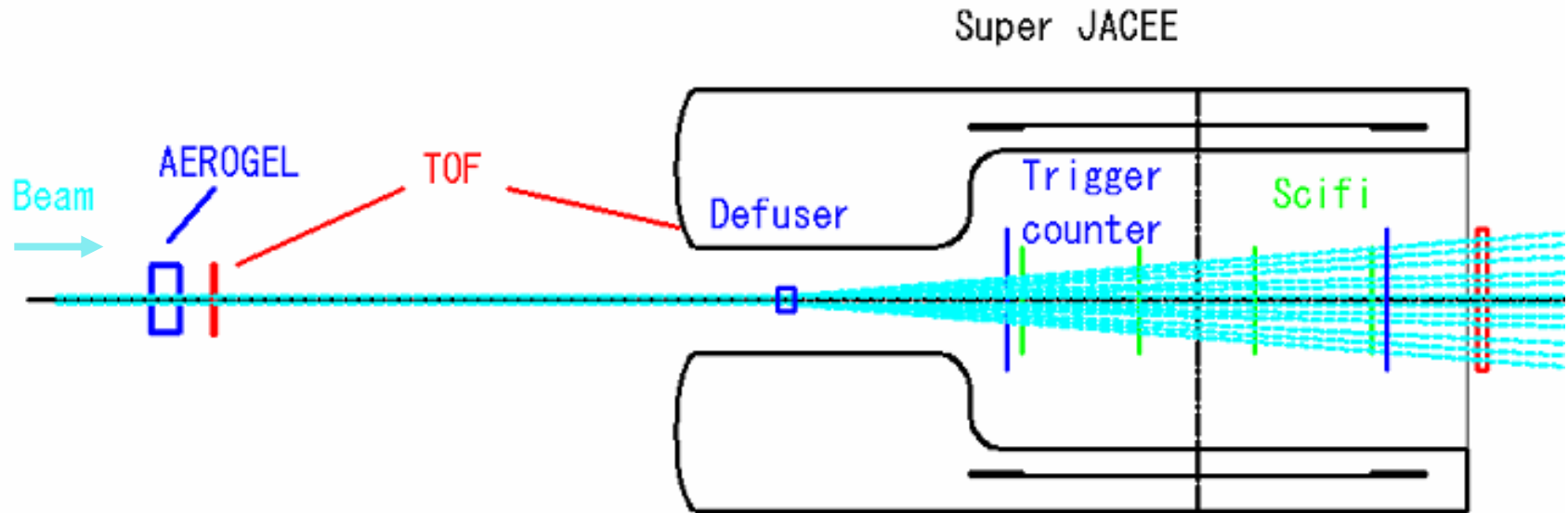
Phase setup (Apr 2005 , KEK pi2)



2nd Phase

- Precision Measurement w/ magnetic field
 - Track finding/Pattern recognition
 - relatively low p beam (0.3 ~ 0.6 GeV/c)
 - Inclined beam
 - Generate Pt using degrader/diffuser
 - Momentum resolution
 - Evaluated with 4 identical station
 - External Momentum measurement
 - TOF hodoscope?
 - Lpath = 12 m, $\sigma\text{TOF}=50\text{ps}$
 - $dp/p = 1\%$?
 - Better if PID is available
 - Position calibration during DAQ w/B field
- Good quality Low p beam?**

Phase setup (Oct 2005 , KEK pi2)



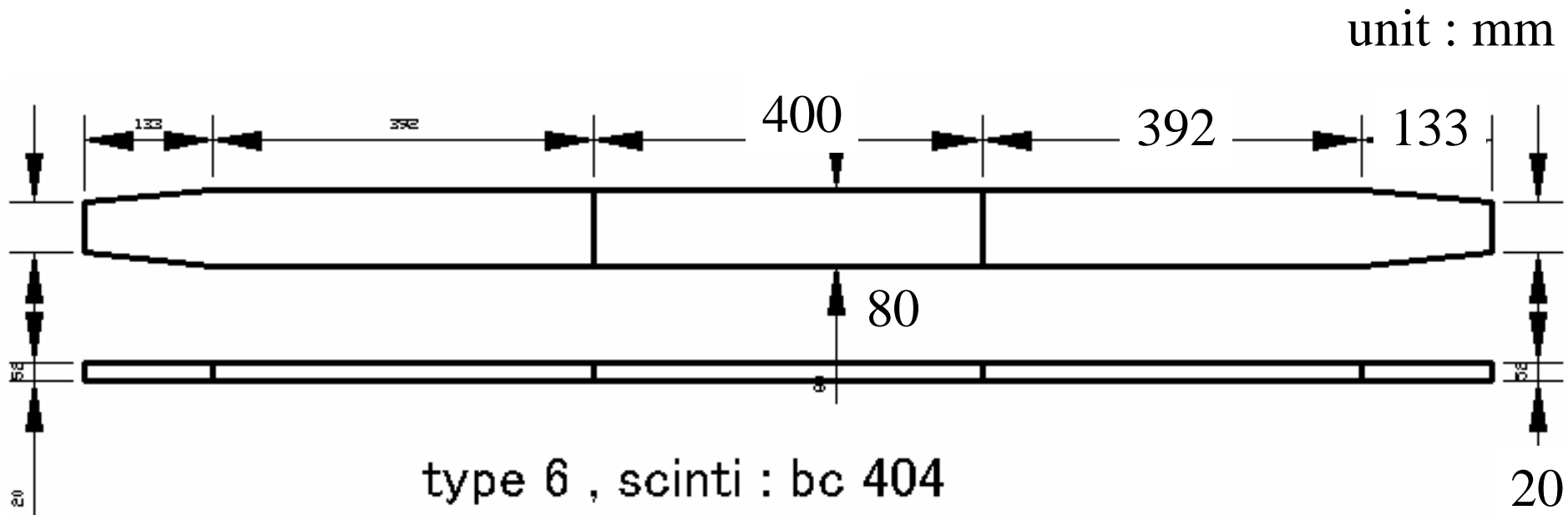
- μ momentum : 300~400MeV /c
- low beam rate
- but , defuser makes many condition of beam

TOF and ACC performance test
&
low momentum beam rate
measurement
for KEK beam test

Atsushi Horikoshi (Osaka Univ.)
Ken'ichi Sakai (Univ. of Tokyo)

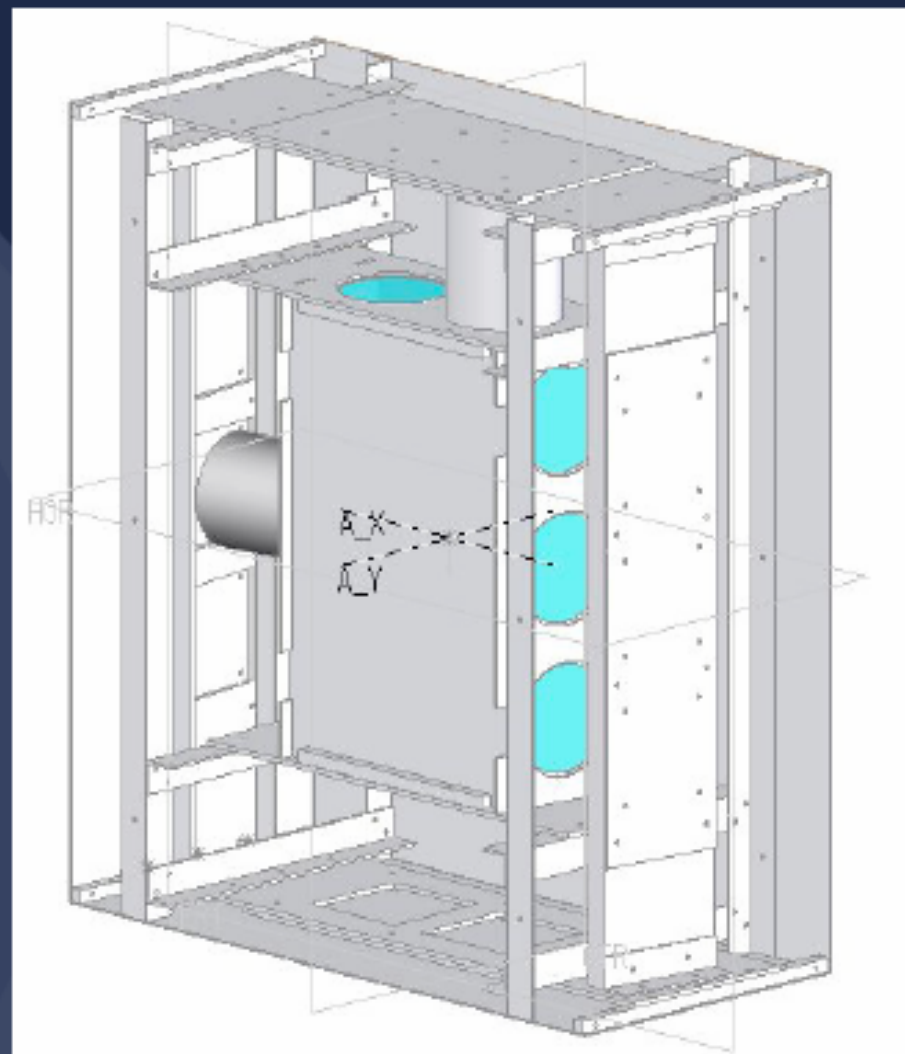
TOF design

- very long light guide to avoid strong magnetic field
- PMT:R6504S fine mesh PMT
(used by BESS , 19DY , strong resistance of magnetic field)

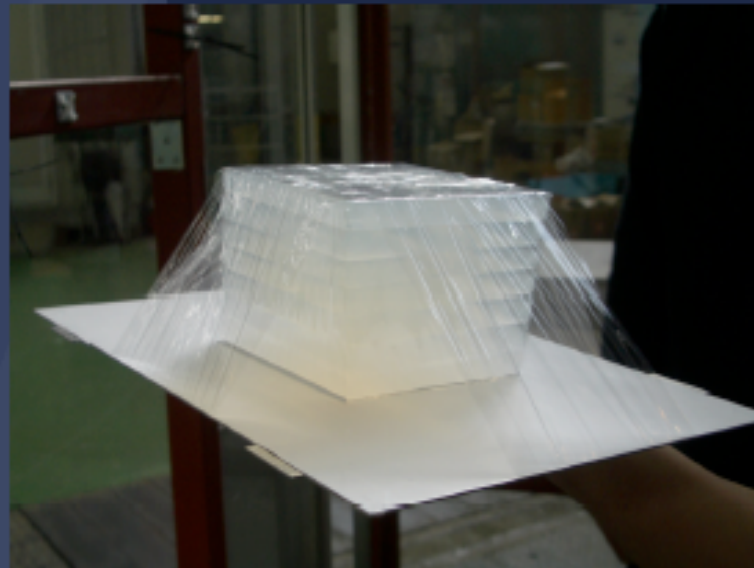
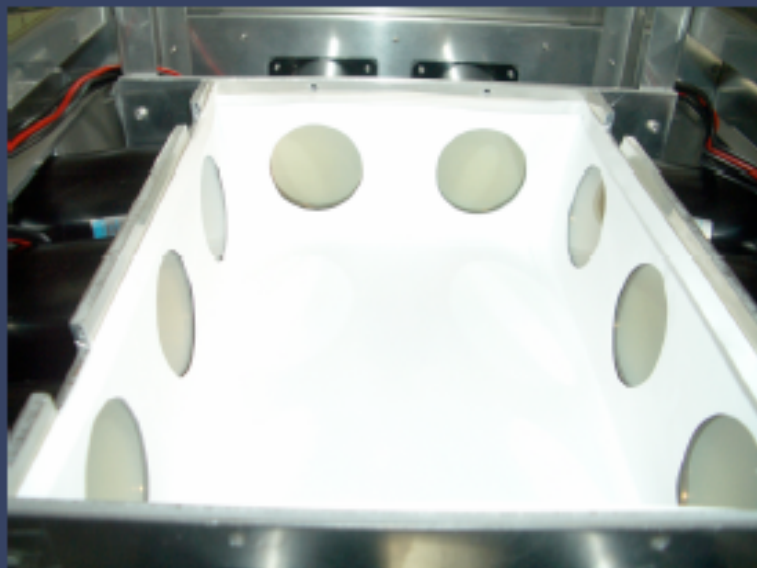
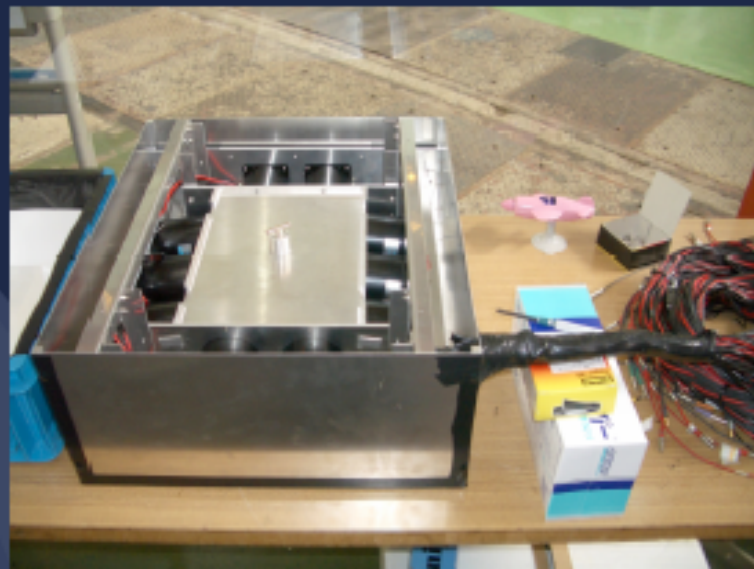
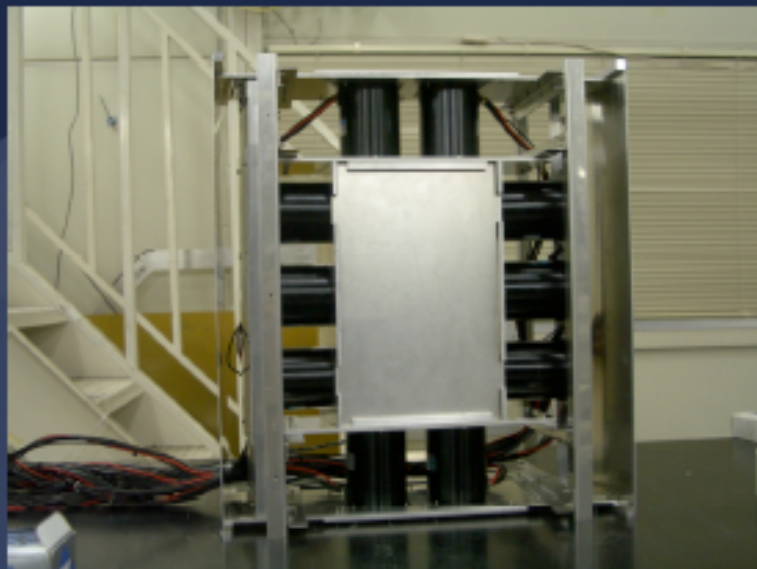


Design of ACC

- 10 PMT's
 - 2.5" Fine Mesh
 - to see diffused light in the block
- Aerogel Block
 - $N=1.034$
 - 8cm x 19.5cm x 278cm
 - $N=1.03$
 - 8cm x 10cm x 8.5cm
- Reflector
 - Goretex hyper sheet

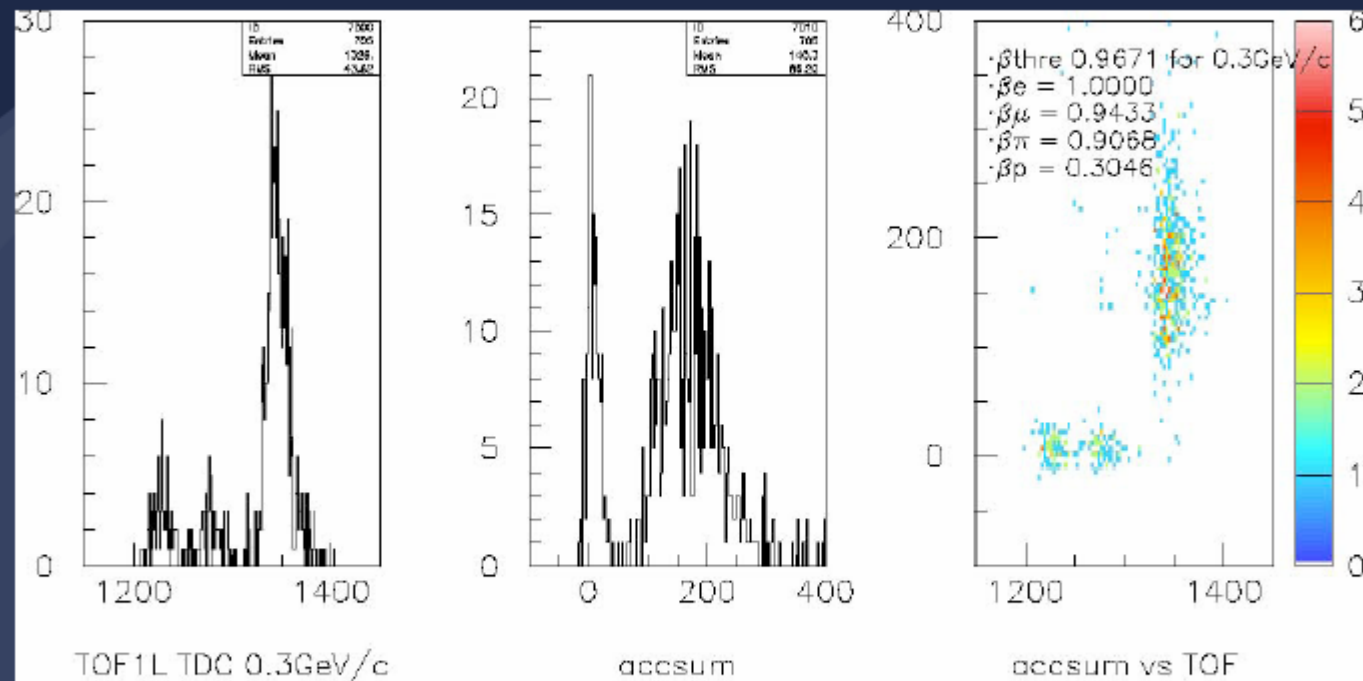


ACC



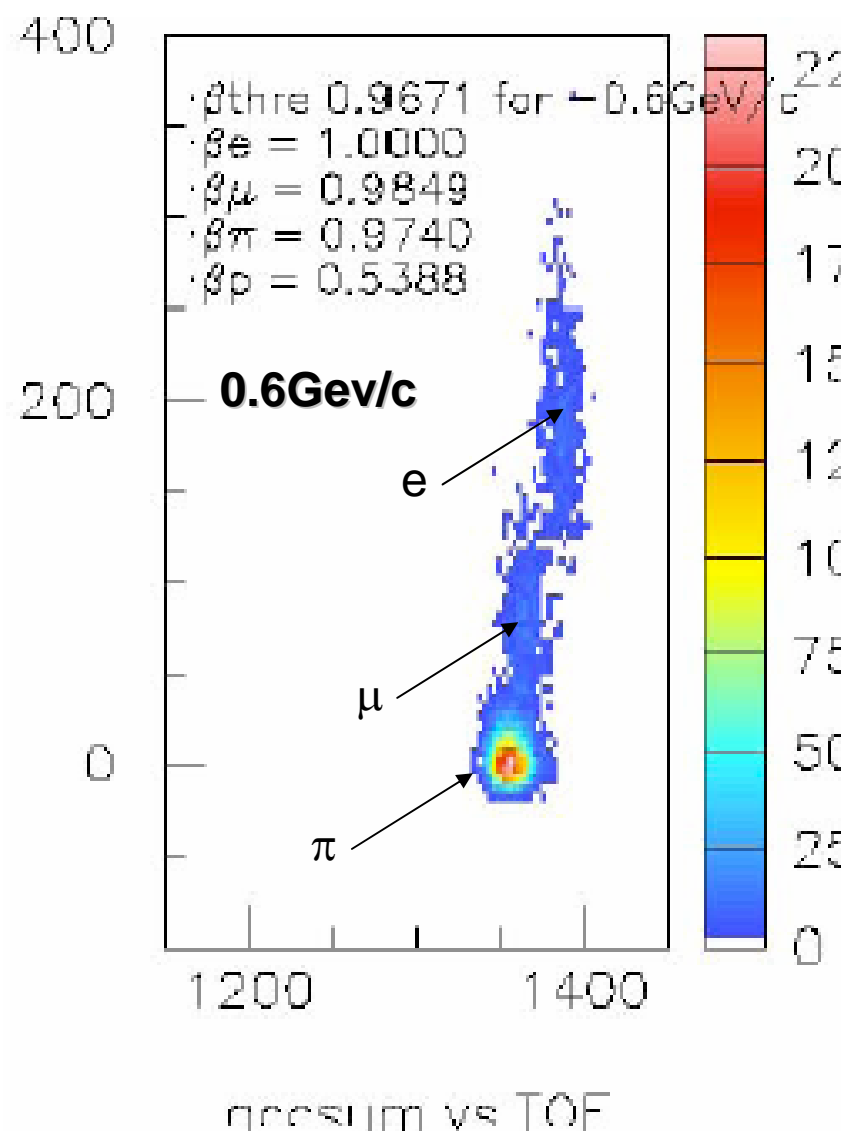
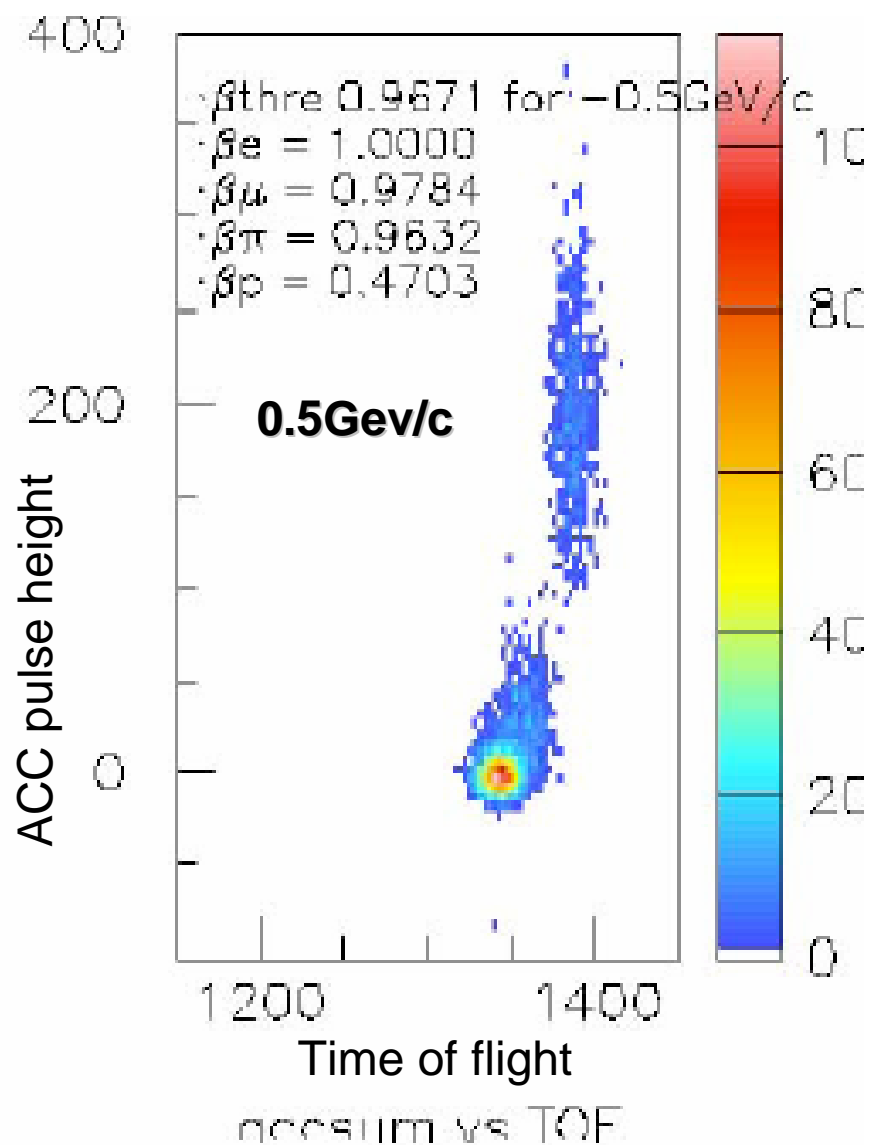
Measurement on low momentum beam

○ ● ● $P=0.3 \text{ GeV}/c$ ($N=1.034$)



Muons come in $\sim 0.3\text{Hz}$ or more at $0.3\text{GeV}/c \rightarrow$ can use for Phase-II

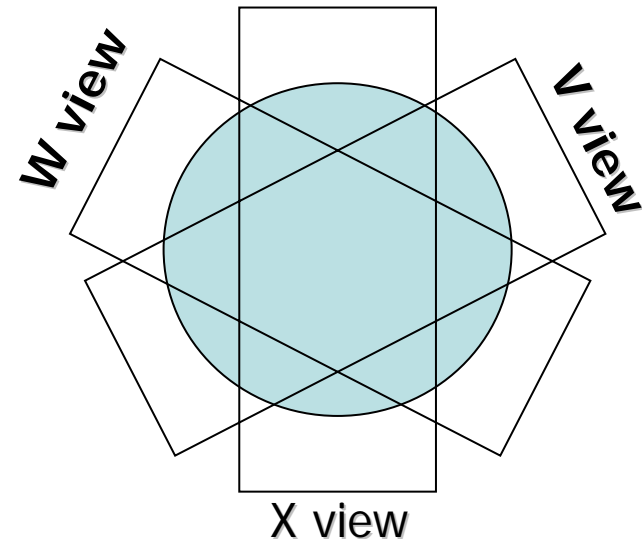
ACC light yield for pi/mu/e



Prototype of SciFi tracker



- Scifi stations
 - Top (station C)
 - X and V view
 - Middle (station B)
 - X,V,W view
 - Bottom (station A)
 - X and W view



Waveguide Connection

126 channel / waveguide

bundle of 18 clear fibers
(4meter long, 1.05mm Φ)



bundle of 7 \times 18 clear fibers



Setup in D0 test stand at Fermilab



Lead blocks
10cm thick
(100MeV for MIP)

Trigger Scintillator
 $36\text{cm} \times 36\text{cm} \times 0.5\text{cm(t)}$



waveguide

AFE (Analog Front End board)

Cryostat for VLPC cassette

Light yield as a function of 3HF concentration

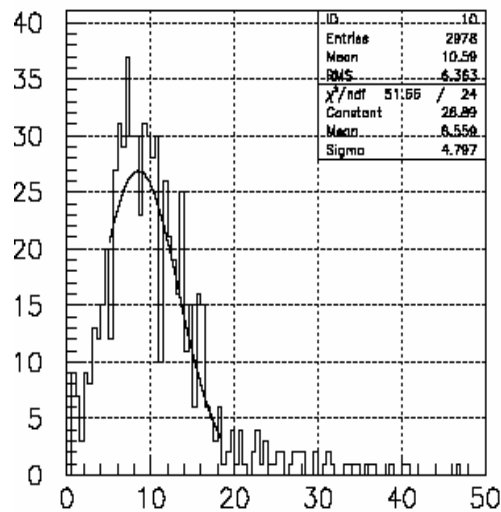
- 3HF concentration in B station

- X view (B) 5000ppm

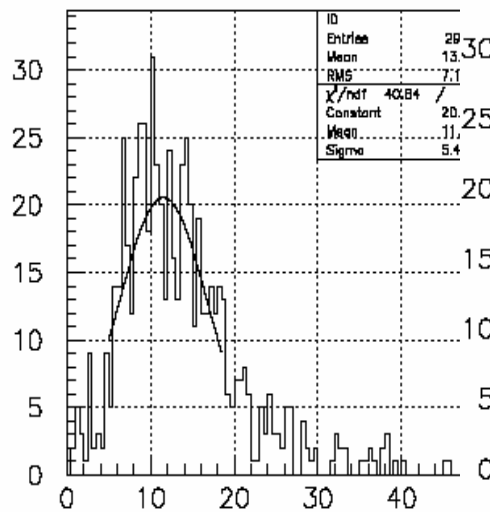
- W view (B) 3500ppm

- V view (B) 2500ppm

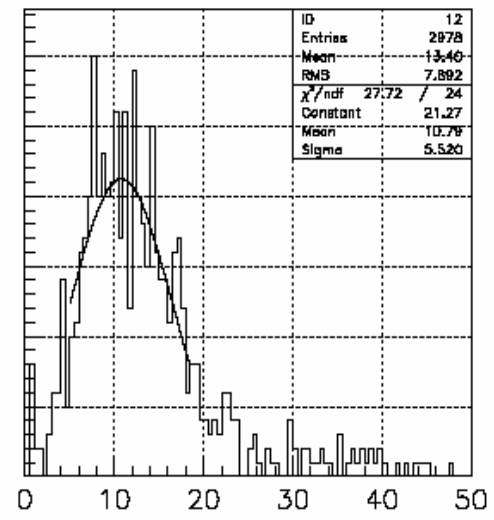
- ADC spectrum for each view



Xview(5000ppm)



Wview(3500ppm)

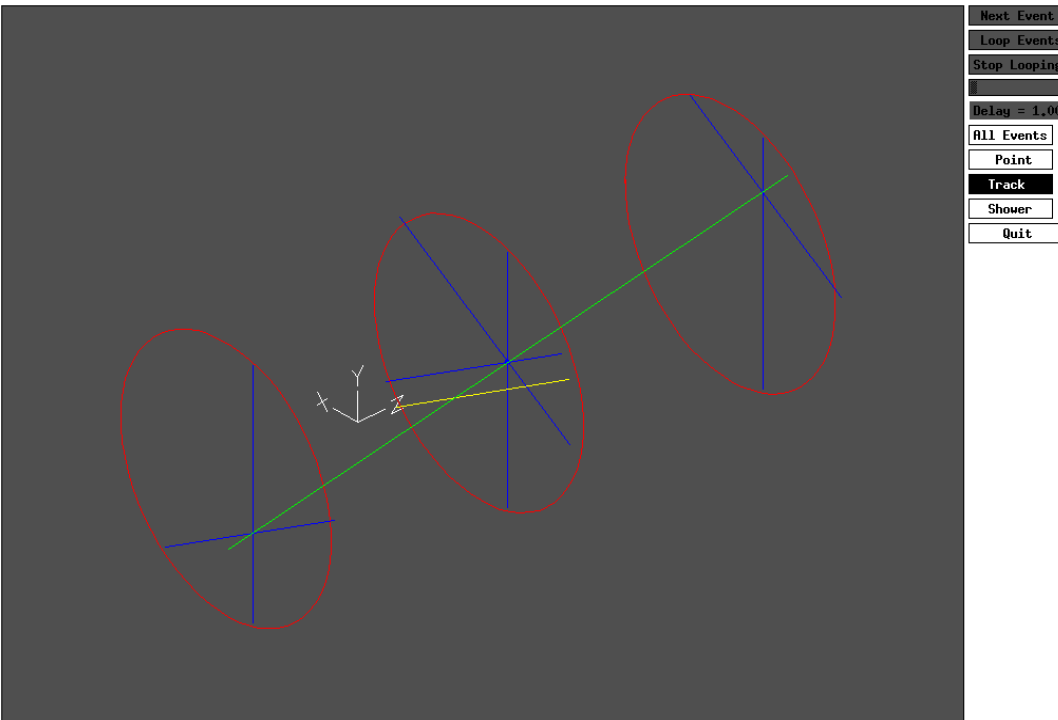


Vview(2500ppm)

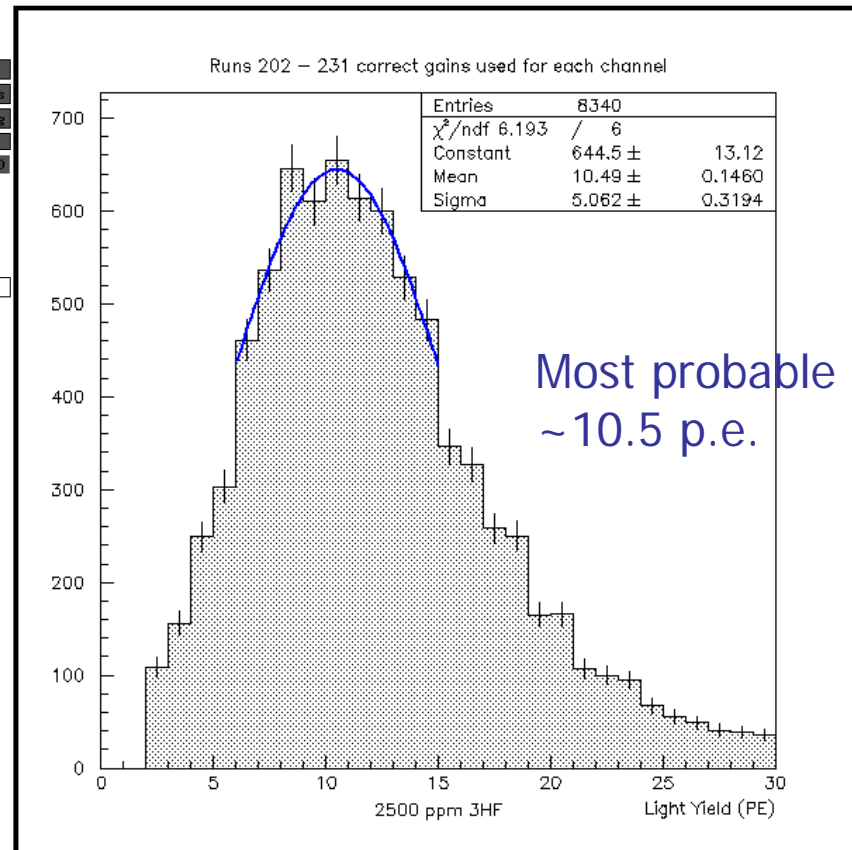
3HF	5000ppm	3500ppm	2500ppm
ADC mean (p.e.)	10.6	13.6	13.4

3D tracking (M. Ellis)

- hit definition : 2.5 p.e. threshold
- tracking in 3D



Typical cosmic-ray event

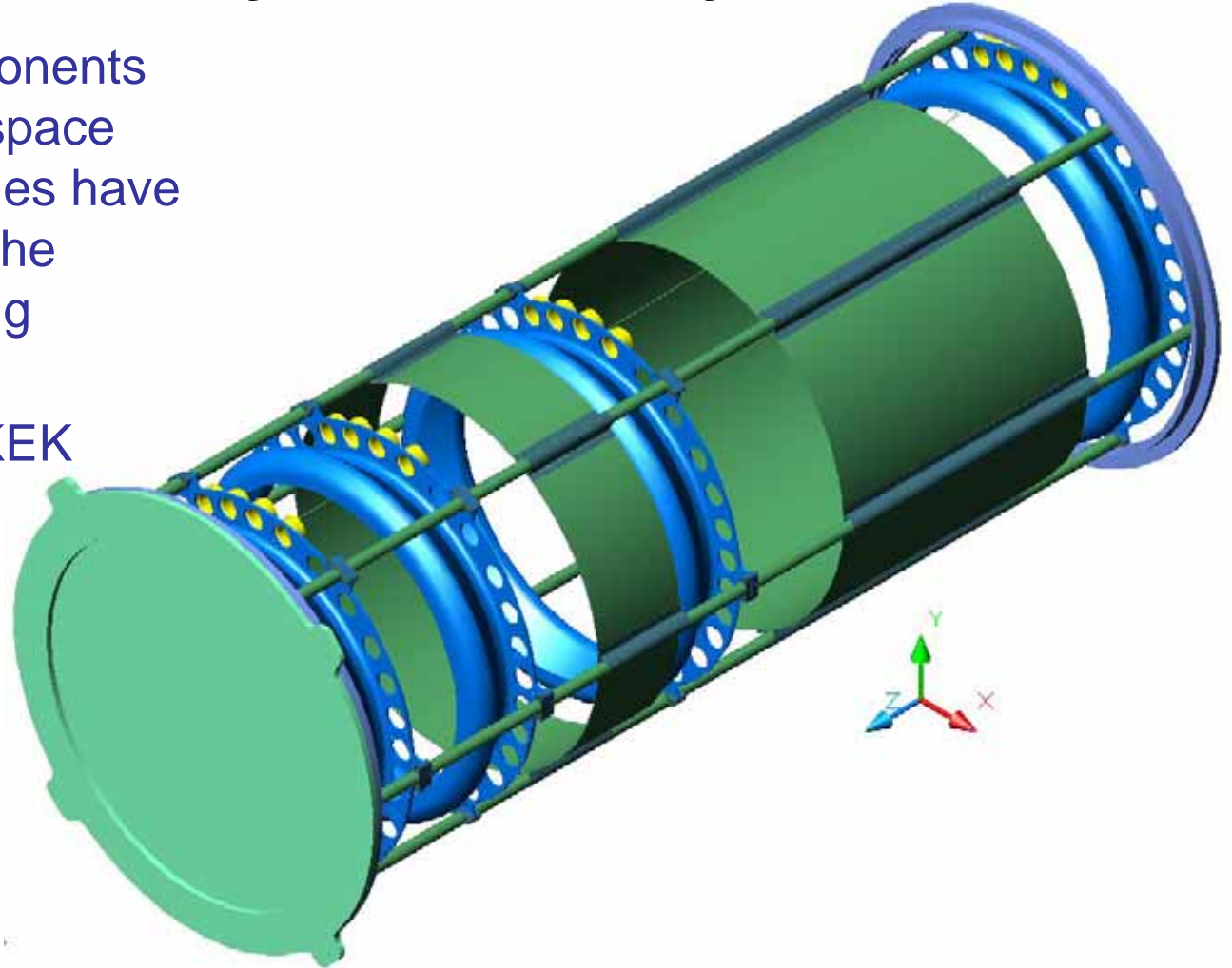


Light yield (3HF2500ppm)

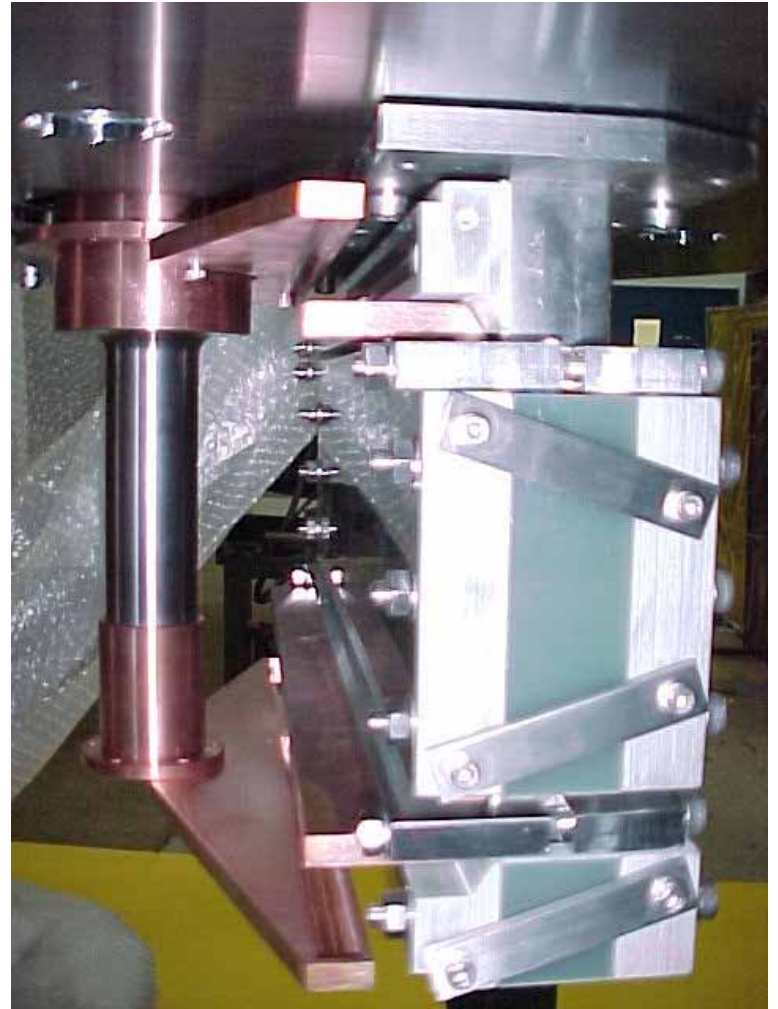
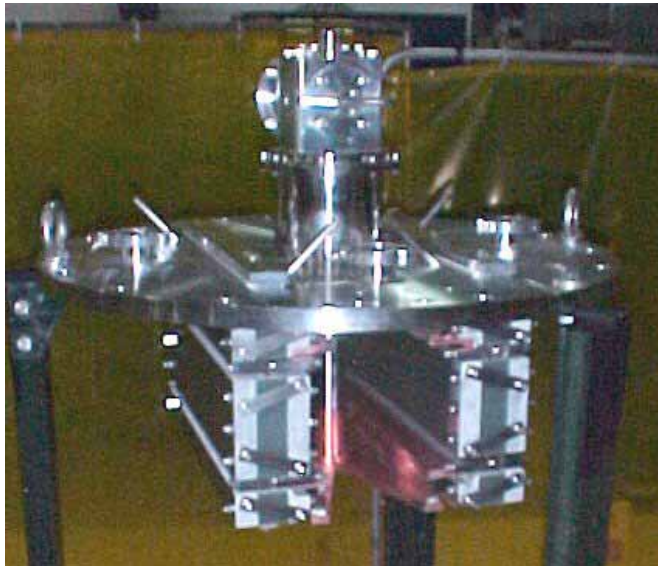
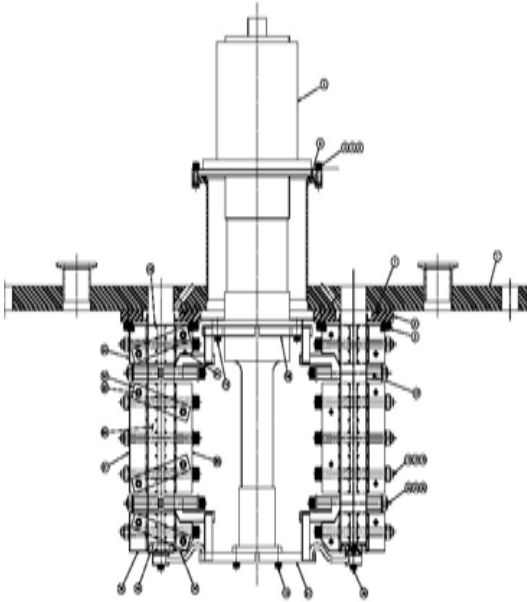
Prototype Layout

All of the components that make the space frame assemblies have been or are in the process of being manufactured.

Ready to ship to KEK in April



Readout – VLPC System



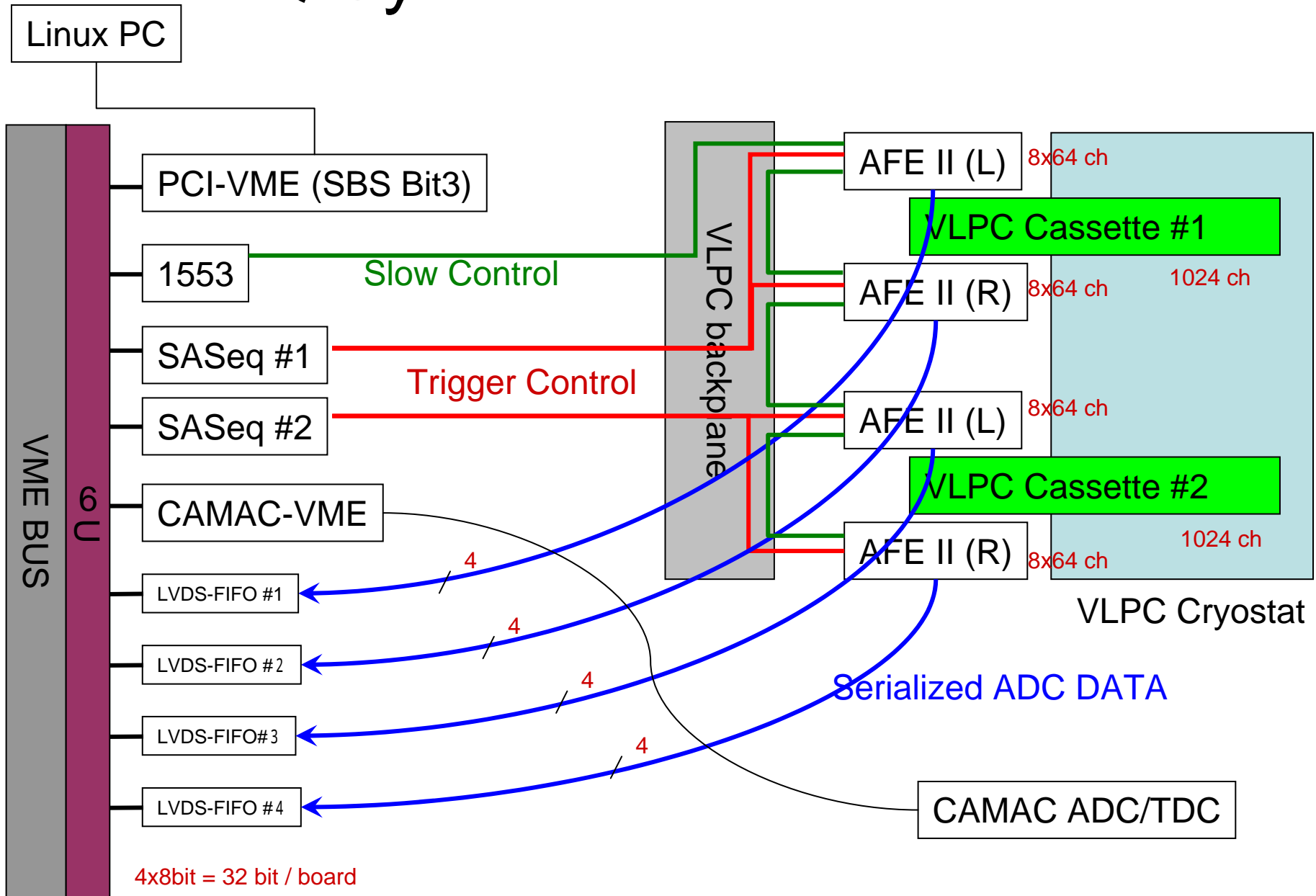
Cryo System Status

- System has been fully assembled and leak checked
 - OK except for the need to replace some O rings
- Compressor for Cryo-cooler wired up.
Extending control cables.
- Next week will install temperature monitoring sensors (for CC) and wire up to vacuum feedthrough
- Run Cryo-cooler only – week of 3/21?
- Cool cassettes – week of 3/28?
- Ship in April or May

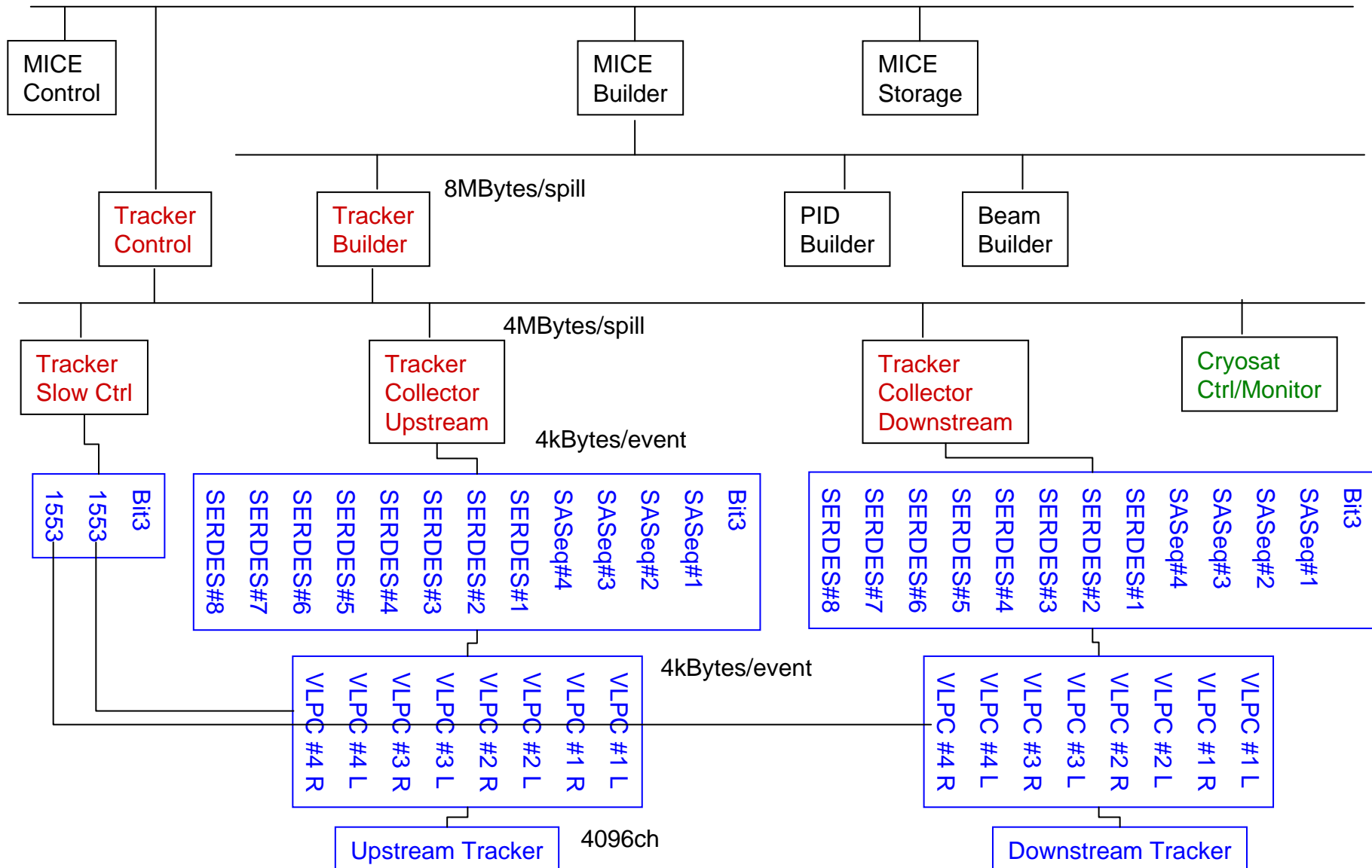
DAQ for the KEK beam test

- Standalone DAQ system for VLPC
- Standalone operation of Cryostat
- Readout TOF counters and the other.
 - CAMAC ADC/TDC
- Readout AFEII on VLPC cassette
 - In KEK beam test, $\sim 1\text{k}$ particles / spill
 - MICE beam ~ 600 muons / 850 usec
 - Existing system used for cosmic-ray test is rather slow ~ 40 events / pulse
 - Need memory module to store data in MICE situation with fast LVDS data links

DAQ System for KEK beam test



An idea of the DAQ architecture

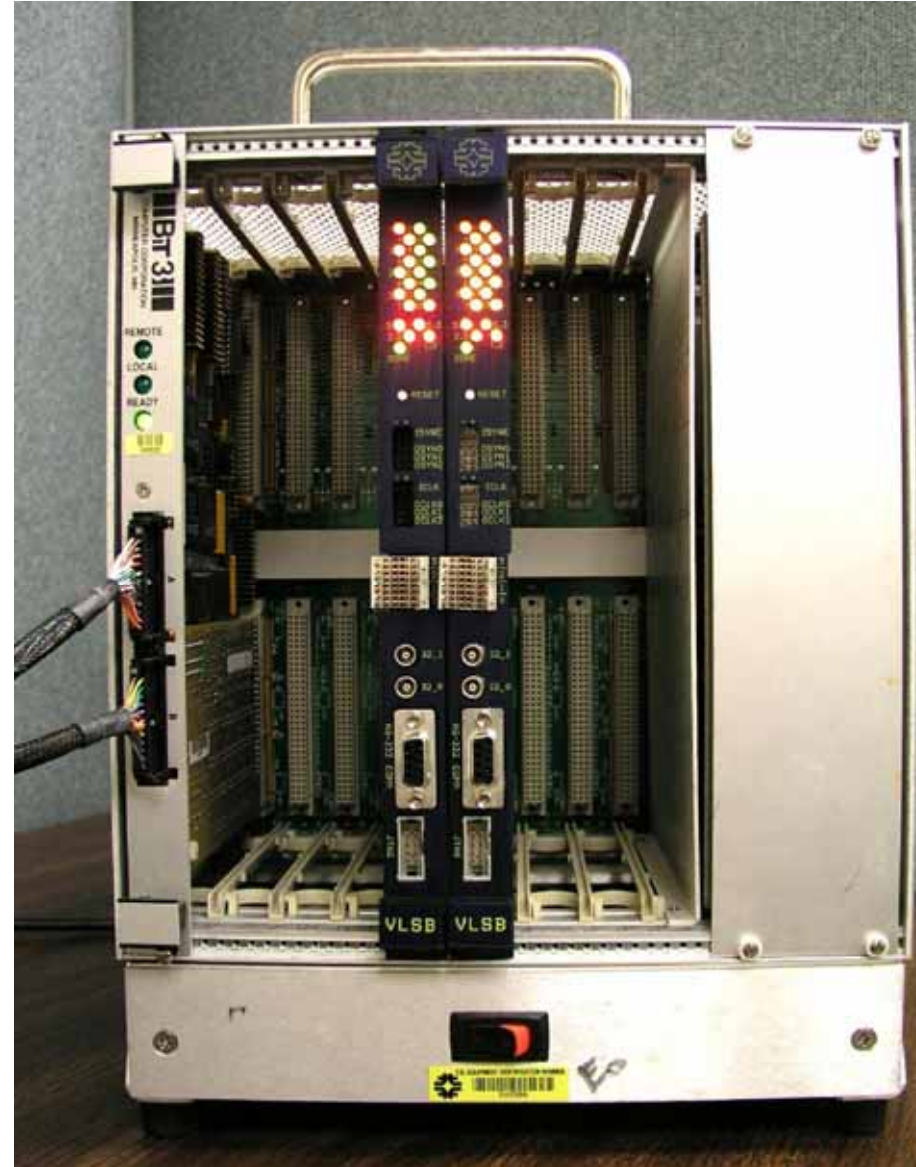


VME LVDS SERDES Buffer (VLSB)

- The D0/MICE VME64 LVDS SERDES Buffer (D0 VLSB) is a VME64 single wide 6U module **SERDES (SERializer-DESerializer)**
- It can be used for Read out and testing the AFEII boards. The module is a custom LVDS
- SERDES Buffer with 4 LVDS inputs channels and can be operated stand-alone with minimal additional hardware.
- The design allows system expansion to multiple modules.
- A D0 VLSB module can receive/generate trigger signals over two Lemo connectors on the module front panel.
- A normal test system configuration consist of a VME 64 subrack where slot 1 is occupied by a VME subrack controller and the D0 VLSB cards will occupy one or more of the remaining slots.

VME LVDS SERDES Buffer (VLSB)

- The Boards (6) are now complete and ready for test and integration into the MICE DAQ system (KEK and final system if we choose to do so)



Conclusion

- We are well along in preparations for a KEK test of the MICE solenoid concept
 - 4 Station Prototype
 - Ready by April
 - New cryo-system with D0 VLPC cassettes
 - 2048 channel
 - Under test this month
 - New electronics
 - D0 AFE II + VLSB board
 - VLSB boards exist, AFE IIs need to be tested
 - Lots of work still to do on DAQ
 - PID
 - Most in good shape
 - Solenoid
 - exists
- Ready by end the May !?

大丈夫